



02356.0086 SEQUENCE LISTING
SEQUENCE LISTING

<110> Institut Pasteur

<120> PLASMODIUM FALCIPARUM ANTIGENS AND VACCINE AND DIAGNOSTIC USES THEREOF

<130> 000466-0035

<150> CA 2,345,206

<151> 2001-05-16

<150> CA 2,346,968

<151> 2001-05-23

<160> 18

<170> PatentIn version 3.1

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<212> DNA

<213> Plasmodium falciparum

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agagaagatc ctattgcttc tgaaactgaa gttgtaagtg aacctgagga ttcaagtagg 180
ataatgacta cagaagttcc aagtactact gtaaaacccc ctgatgaaaa acgatctgaa 240
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Thr Glu Val Val Ser Glu Pro Glu Asp Ser Ser Arg Ile Met Thr Thr
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Glu Val Pro Ser Thr Thr Val Lys Pro Pro Asp Glu Lys Arg Ser Glu
65 70 75 80

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| Met | Lys | Thr | Thr | Lys | Glu | Asn | Asp | Asn | Asn | Asn | Ile | Val | His | Tyr | Val | |
| 1 | | | | 5 | | | | 10 | | | | | | 15 | | |

| | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|
| gat | tgg | ata | aac | cag | att | ttt | aaa | aag | aat | tct | tta | caa | tgt | gat | tta | 96 |
| Asp | Trp | Ile | Asn | Gln | Ile | Phe | Lys | Lys | Asn | Ser | Leu | Gln | Cys | Asp | Leu | |
| | | | 20 | | | | | 25 | | | | | 30 | | | |

| | | | | | | | | | | | | | | | | |
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| tat | ttt | ttg | gat | gac | aac | aaa | gaa | aaa | gat | gtt | agt | aag | aaa | aga | aaa | 144 |
| Tyr | Phe | Leu | Asp | Asp | Asn | Lys | Glu | Lys | Asp | Val | Ser | Lys | Lys | Arg | Lys | |
| | | 35 | | | | | 40 | | | | | 45 | | | | |

| | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| gct | caa | ttg | aag | gat | gaa | tat | gat | aat | ata | tca | agg | agc | aaa | gaa | aat | 192 |
| Ala | Gln | Leu | Lys | Asp | Glu | Tyr | Asp | Asn | Ile | Ser | Arg | Ser | Lys | Glu | Asn | |
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| att Ile 65 | aat Asn | aat Asn | tcc Ser | aaa Lys | aaa Lys 70 | ata Ile | aaa Lys | aat Asn | gaa Glu | tta Leu 75 | agt Ser | ata Ile | aaa Lys | gat Asp | aat Asn 80 | 240 |
| atg Met | cac His | gat Asp | tac Tyr | ata Ile 85 | tat Tyr | gat Asp | gat Asp | cgt Arg | atc Ile 90 | tac Tyr | aat Asn | aat Asn | gat Asp | aaa Lys 95 | gag Glu | 288 |
| aaa Lys | aat Asn | gtt Val | ata Ile 100 | aaa Lys | agt Ser | gat Asp | aat Asn | aaa Lys 105 | aat Asn | gtt Val | ata Ile | aaa Lys | agt Ser 110 | gat Asp | aat Asn | 336 |
| aaa Lys | aat Asn | gat Asp 115 | tat Tyr | aaa Lys | aag Lys | tgt Cys | aat Asn 120 | aaa Lys | aat Asn | gtt Val | ata Ile | aaa Lys 125 | agt Ser | gat Asp | aat Asn | 384 |
| aaa Lys | aat Asn 130 | gtt Val | ata Ile | aaa Lys | agt Ser | gat Asp 135 | aat Asn | aaa Lys | aat Asn | gtt Val | ata Ile 140 | aaa Lys | agt Ser | gat Asp | aat Asn | 432 |
| aaa Lys 145 | aat Asn | gtt Val | ata Ile | aaa Lys | agt Ser 150 | gat Asp | tat Tyr | aaa Lys | agt Ser | gat Asp 155 | aga Arg | aat Asn | gct Ala | tgt Cys 160 | | 480 |
| gat Asp | att Ile | tat Tyr | aaa Lys | agt Ser 165 | aat Asn | aaa Lys | aaa Lys | aat Asn | gtt Val 170 | cct Pro | gat Asp | aat Asn | tgc Cys | cat His 175 | ata Ile | 528 |
| tat Tyr | gat Asp | gat Asp | aat Asn 180 | agt Ser | tca Ser | gtt Val | gaa Glu | aat Asn 185 | tta Leu | gat Asp | gga Gly | aaa Lys | aat Asn 190 | aaa Lys | tta Leu | 576 |
| aat Asn | aat Asn | ata Ile 195 | agg Arg | aac Asn | ata Ile | cat His | aat Asn 200 | gat Asp | aac Asn | tca Ser | tct Ser | tca Ser 205 | tgc Cys | gat Asp | ata Ile | 624 |
| tcc Ser | gat Asp 210 | ata Ile | aaa Lys | agt Ser | gaa Glu | gat Asp 215 | gaa Glu | tat Tyr | ata Ile | gaa Glu | cca Pro 220 | tat Tyr | gaa Glu | aaa Lys | aag Lys | 672 |
| aat Asn 225 | gaa Glu | gaa Glu | aat Asn | ata Ile | aat Asn 230 | gaa Glu | tat Tyr | aag Lys | aat Asn | aag Lys 235 | aaa Lys | aat Asn | ata Ile | gcc Ala | aat Asn 240 | 720 |
| gaa Glu | aat Asn | ata Ile | aaa Lys | gaa Glu 245 | gga Gly | aag Lys | agt Ser | tca Ser | att Ile 250 | tat Tyr | aat Asn | gat Asp | gaa Glu | cat His 255 | aat Asn | 768 |
| tat Tyr | aat Asn | tca Ser | tta Leu 260 | tta Leu | tat Tyr | aat Asn | tct Ser | tgt Cys 265 | aat Asn | ggt Gly | gaa Glu | ata Ile | agt Ser 270 | aag Lys | atc Ile | 816 |
| aac Asn | aaa Lys | ata Ile 275 | agt Ser | agt Ser | cat His | aat Asn | aat Asn 280 | att Ile | gat Asp | aat Asn | aat Asn | atg Met 285 | gat Asp | aat Asn | tat Tyr | 864 |
| aat Asn | acg Thr 290 | ttt Phe | gca Ala | aat Asn | gtg Val 295 | aat Asn | aat Asn | ttt Phe | ata Ile | ata Ile | tat Tyr 300 | tcc Ser | tca Ser | gat Asp | gat Asp | 912 |
| gaa Glu | gat Asp | aat Asn | ata Ile | tca Ser | aat Asn | tat Tyr | tat Tyr | aat Asn | ggt Gly | aaa Lys | gac Asp | gta Val | tta Leu | aat Asn | gat Asp | 960 |

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| gag att atg ttc cct ata aaa ttt aat ttt gaa aaa tta aaa aaa aat | | | | | | | 1008 |
| Glu Ile Met Phe Pro 325 | | Ile Lys Phe Asn Phe 330 | | Glu Lys Leu Lys Lys 335 | | Asn | |
| att tat gta ata gag cat ata gac aaa ata tat tat gat aca ttt tta | | | | | | | 1056 |
| Ile Tyr Val Ile Glu His Ile Asp Lys 345 | | Ile Tyr Tyr Asp Thr 350 | | Phe Leu | | | |
| aat aaa aat cca agt gaa aaa agt gtt ttt atg aat gat gaa tct act | | | | | | | 1104 |
| Asn Lys Asn 355 | | Pro Ser Glu Lys Ser 360 | | Val Phe Met Asn Asp 365 | | Glu Ser Thr | |
| ggt tat ttg aaa aat gat gtg aat gac aaa tgt gtt gtt gat aat ata | | | | | | | 1152 |
| Gly Tyr Leu Lys Asn Asp Val 375 | | Asn Asp Lys Cys Val 380 | | Val Val Asp Asn Ile | | | |
| aat gtt att aat cct tct agt gtg aat acg ttg agt aat att tca aat | | | | | | | 1200 |
| Asn Val Ile Asn Pro Ser Ser Val 390 | | Asn Thr Leu Ser Asn Ile Ser 400 | | | | | |
| att agg aat gaa aaa ata gaa aat aat aat aag aat gaa aaa tta ata | | | | | | | 1248 |
| Ile Arg Asn Glu Lys 405 | | Ile Glu Asn Asn Asn Lys Asn Glu Lys 415 | | Leu Ile | | | |
| aaa tca tat cct aca caa tca aaa aat gtt atg agt aca ttt tcc ttt | | | | | | | 1296 |
| Lys Ser Tyr Pro 420 | | Thr Gln Ser Lys Asn Val 425 | | Met Ser Thr Phe 430 | | Ser Phe | |
| tgg aat att gaa aag gag aca ttt ata aca aaa cct ttg tat gca caa | | | | | | | 1344 |
| Trp Asn Ile 435 | | Glu Lys Glu Thr Phe 440 | | Ile Thr Lys Pro Leu Tyr 445 | | Ala Gln | |
| aat ttg aga aaa aaa caa ttt agt tta tta gat gaa tct gaa gag atg | | | | | | | 1392 |
| Asn Leu Arg Lys Lys Gln Phe 455 | | Ser Leu Leu Asp Glu Ser Glu Glu Met 460 | | | | | |
| ata aga aat tat tca tct aat caa tat tct ata aaa ttt gta cca aga | | | | | | | 1440 |
| Ile Arg Asn Tyr Ser Ser Asn Gln Tyr Ser Ile Lys Phe Val Pro Arg 480 | | | | | | | |
| cat tta tta tat gta atg agt caa gtt gct tct cga tcc ttt ttt gat | | | | | | | 1488 |
| His Leu Leu Tyr Val 485 | | Met Ser Gln Val Ala Ser Arg Ser Phe Phe 495 | | Asp | | | |
| cct tta tat aga aag cag tta ttt ttt cgt tac taa | | | | | | | 1524 |
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 Tyr Phe Leu Asp Asp Asn Lys Glu Lys Asp Val Ser Lys Lys Arg Lys
 35 40 45
 Ala Gln Leu Lys Asp Glu Tyr Asp Asn Ile Ser Arg Ser Lys Glu Asn
 50 55 60
 Ile Asn Asn Ser Lys Lys Ile Lys Asn Glu Leu Ser Ile Lys Asp Asn
 65 70 75 80
 Met His Asp Tyr Ile Tyr Asp Asp Arg Ile Tyr Asn Asn Asp Lys Glu
 85 90 95
 Lys Asn Val Ile Lys Ser Asp Asn Lys Asn Val Ile Lys Ser Asp Asn
 100 105 110
 Lys Asn Asp Tyr Lys Lys Cys Asn Lys Asn Val Ile Lys Ser Asp Asn
 115 120 125
 Lys Asn Val Ile Lys Ser Asp Asn Lys Asn Val Ile Lys Ser Asp Asn
 130 135 140
 Lys Asn Val Ile Lys Ser Asp Tyr Lys Ser Asp Arg Asn Ala Cys
 145 150 155 160
 Asp Ile Tyr Lys Ser Asn Lys Lys Asn Val Pro Asp Asn Cys His Ile
 165 170 175
 Tyr Asp Asp Asn Ser Ser Val Glu Asn Leu Asp Gly Lys Asn Lys Leu
 180 185 190
 Asn Asn Ile Arg Asn Ile His Asn Asp Asn Ser Ser Ser Cys Asp Ile
 195 200 205
 Ser Asp Ile Lys Ser Glu Asp Glu Tyr Ile Glu Pro Tyr Glu Lys Lys
 210 215 220
 Asn Glu Glu Asn Ile Asn Glu Tyr Lys Asn Lys Lys Asn Ile Ala Asn
 225 230 235 240
 Glu Asn Ile Lys Glu Gly Lys Ser Ser Ile Tyr Asn Asp Glu His Asn
 245 250 255

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Tyr Asn Ser Leu Leu Tyr Asn Ser Cys Asn Gly Glu Ile Ser Lys Ile
 260 265 270
 Asn Lys Ile Ser Ser His Asn Asn Ile Asp Asn Asn Met Asp Asn Tyr
 275 280 285
 Asn Thr Phe Ala Asn Val Asn Asn Phe Ile Ile Tyr Ser Ser Asp Asp
 290 295 300
 Glu Asp Asn Ile Ser Asn Tyr Tyr Asn Gly Lys Asp Val Leu Asn Asp
 305 310 315 320
 Glu Ile Met Phe Pro Ile Lys Phe Asn Phe Glu Lys Leu Lys Lys Asn
 325 330 335
 Ile Tyr Val Ile Glu His Ile Asp Lys Ile Tyr Tyr Asp Thr Phe Leu
 340 345 350
 Asn Lys Asn Pro Ser Glu Lys Ser Val Phe Met Asn Asp Glu Ser Thr
 355 360 365
 Gly Tyr Leu Lys Asn Asp Val Asn Asp Lys Cys Val Val Asp Asn Ile
 370 375 380
 Asn Val Ile Asn Pro Ser Ser Val Asn Thr Leu Ser Asn Ile Ser Asn
 385 390 395 400
 Ile Arg Asn Glu Lys Ile Glu Asn Asn Asn Lys Asn Glu Lys Leu Ile
 405 410 415
 Lys Ser Tyr Pro Thr Gln Ser Lys Asn Val Met Ser Thr Phe Ser Phe
 420 425 430
 Trp Asn Ile Glu Lys Glu Thr Phe Ile Thr Lys Pro Leu Tyr Ala Gln
 435 440 445
 Asn Leu Arg Lys Lys Gln Phe Ser Leu Leu Asp Glu Ser Glu Glu Met
 450 455 460
 Ile Arg Asn Tyr Ser Ser Asn Gln Tyr Ser Ile Lys Phe Val Pro Arg
 465 470 475 480
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| 1 5 10 15 | | |
| tat gtt gta tta tgt acc tat gta tta ggt ata agt gaa gag tat ttg | | 96 |
| Tyr Val Val Leu Cys Thr Tyr Val Leu Gly Ile Ser Glu Glu Tyr Leu | | |
| 20 25 30 | | |
| aag gaa agg ccc caa ggt tta aat gtt gag act aat aat aat aat aat | | 144 |
| Lys Glu Arg Pro Gln Gly Leu Asn Val Glu Thr Asn Asn Asn Asn Asn | | |

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35

| | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| aat | aat | aat | aat | aat | aat | agt | aat | agt | aac | gat | gcg | atg | tct | ttt | gta | 192 |
| Asn | Asn | Asn | Asn | Asn | Asn | Ser | Asn | Ser | Asn | Asp | Ala | Met | Ser | Phe | Val | |
| 50 | | | | | | 55 | | | | 60 | | | | | | |
| aat | gaa | gta | ata | agg | ttt | ata | gaa | aac | gag | aag | gat | gat | aaa | gaa | gat | 240 |
| Asn | Glu | Val | Ile | Arg | Phe | Ile | Glu | Asn | Glu | Lys | Asp | Asp | Lys | Glu | Asp | |
| 65 | | | | | 70 | | | | 75 | | | | | 80 | | |
| aaa | aaa | gtg | aag | ata | ata | tct | aga | cct | ggt | gag | aat | aca | tta | cat | aga | 288 |
| Lys | Lys | Val | Lys | Ile | Ile | Ser | Arg | Pro | Val | Glu | Asn | Thr | Leu | His | Arg | |
| | | | | 85 | | | | | 90 | | | | | 95 | | |
| tat | cca | gtt | agt | tct | ttt | ctg | aat | atc | aaa | aag | tat | ggt | agg | aaa | ggg | 336 |
| Tyr | Pro | Val | Ser | Ser | Phe | Leu | Asn | Ile | Lys | Lys | Tyr | Gly | Arg | Lys | Gly | |
| | | | 100 | | | | | 105 | | | | | 110 | | | |
| gaa | tat | ttg | aat | aga | aat | agt | ttt | ggt | caa | aga | tca | tat | ata | agg | ggt | 384 |
| Glu | Tyr | Leu | Asn | Arg | Asn | Ser | Phe | Val | Gln | Arg | Ser | Tyr | Ile | Arg | Gly | |
| | | 115 | | | | | 120 | | | | | 125 | | | | |
| tgt | aaa | gga | aaa | aga | agc | aca | cat | aca | tgg | ata | tgt | gaa | aat | aaa | ggg | 432 |
| Cys | Lys | Gly | Lys | Arg | Ser | Thr | His | Thr | Trp | Ile | Cys | Glu | Asn | Lys | Gly | |
| | 130 | | | | | 135 | | | | | 140 | | | | | |
| aat | aat | aat | ata | tgt | att | cct | gat | aga | cgt | gta | caa | tta | tgt | ata | aca | 480 |
| Asn | Asn | Asn | Ile | Cys | Ile | Pro | Asp | Arg | Arg | Val | Gln | Leu | Cys | Ile | Thr | |
| 145 | | | | | 150 | | | | | 155 | | | | | 160 | |
| gct | ctt | caa | gat | tta | aaa | aat | tca | gga | tct | gaa | acg | act | gat | aga | aaa | 528 |
| Ala | Leu | Gln | Asp | Leu | Lys | Asn | Ser | Gly | Ser | Glu | Thr | Thr | Asp | Arg | Lys | |
| | | | | 165 | | | | 170 | | | | | | 175 | | |
| tta | tta | aga | gat | aaa | gta | ttt | gat | tca | gct | atg | tat | gaa | act | gat | ttg | 576 |
| Leu | Leu | Arg | Asp | Lys | Val | Phe | Asp | Ser | Ala | Met | Tyr | Glu | Thr | Asp | Leu | |
| | | | 180 | | | | | 185 | | | | | 190 | | | |
| tta | tgg | aat | aaa | tat | ggt | ttt | cgt | gga | ttt | gat | gat | ttt | tgt | gac | gat | 624 |
| Leu | Trp | Asn | Lys | Tyr | Gly | Phe | Arg | Gly | Phe | Asp | Asp | Phe | Cys | Asp | Asp | |
| | | 195 | | | | | 200 | | | | | 205 | | | | |
| gta | aaa | aat | agt | tat | tta | gat | tat | aaa | gat | ggt | ata | ttt | gga | acc | gat | 672 |
| Val | Lys | Asn | Ser | Tyr | Leu | Asp | Tyr | Lys | Asp | Val | Ile | Phe | Gly | Thr | Asp | |
| | 210 | | | | | 215 | | | | | 220 | | | | | |
| tta | gat | aaa | aat | aat | ata | tca | aag | tta | gta | gag | gaa | tca | tta | aaa | cgt | 720 |
| Leu | Asp | Lys | Asn | Asn | Ile | Ser | Lys | Leu | Val | Glu | Glu | Ser | Leu | Lys | Arg | |
| 225 | | | | | 230 | | | | | 235 | | | | | 240 | |
| ttt | ttt | aaa | aaa | gat | agt | agt | gta | ctt | aat | cct | act | gct | tgg | tgg | aga | 768 |
| Phe | Phe | Lys | Lys | Asp | Ser | Ser | Val | Leu | Asn | Pro | Thr | Ala | Trp | Trp | Arg | |
| | | | | 245 | | | | | 250 | | | | 255 | | | |
| agg | tat | gga | aca | aga | cta | tgg | aaa | act | atg | ata | cag | cca | tat | gct | cat | 816 |
| Arg | Tyr | Gly | Thr | Arg | Leu | Trp | Lys | Thr | Met | Ile | Gln | Pro | Tyr | Ala | His | |
| | | | 260 | | | | | 265 | | | | | 270 | | | |
| tta | gga | tgt | aga | aaa | cct | gat | gag | aat | gaa | cct | cag | ata | aat | aga | tgg | 864 |
| Leu | Gly | Cys | Arg | Lys | Pro | Asp | Glu | Asn | Glu | Pro | Gln | Ile | Asn | Arg | Trp | |
| | | 275 | | | | | 280 | | | | | 285 | | | | |
| att | ctg | gaa | tgg | ggg | aaa | tat | aat | tgt | aga | tta | atg | aag | gag | aaa | gaa | 912 |

| 02356.0086 SEQUENCE LISTING | | | | | | | | | | | | | | | | |
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| Ile | Leu | Glu | Trp | Gly | Lys | Tyr | Asn | Cys | Arg | Leu | Met | Lys | Glu | Lys | Glu | |
| 290 | | | | | | 295 | | | | | 300 | | | | | |
| aaa | ttg | tta | aca | gga | gaa | tgt | tct | gtt | aat | aga | aaa | aaa | tct | gac | tgc | 960 |
| Lys | Leu | Leu | Thr | Gly | Glu | Cys | Ser | Val | Asn | Arg | Lys | Lys | Ser | Asp | Cys | |
| 305 | | | | | 310 | | | | | 315 | | | | | 320 | |
| tca | acc | gga | tgt | aat | aat | gag | tgt | tat | acc | tat | agg | agt | ctt | att | aat | 1008 |
| Ser | Thr | Gly | Cys | Asn | Asn | Glu | Cys | Tyr | Thr | Tyr | Arg | Ser | Leu | Ile | Asn | |
| | | | | 325 | | | | | 330 | | | | | 335 | | |
| aga | caa | aga | tat | gag | gtc | tct | ata | tta | gga | aaa | aaa | tat | att | aaa | gta | 1056 |
| Arg | Gln | Arg | Tyr | Glu | Val | Ser | Ile | Leu | Gly | Lys | Lys | Tyr | Ile | Lys | Val | |
| | | | 340 | | | | | 345 | | | | | 350 | | | |
| gta | cga | tat | act | ata | ttt | agg | aga | aaa | ata | gtt | caa | cct | gat | aat | gct | 1104 |
| Val | Arg | Tyr | Thr | Ile | Phe | Arg | Arg | Lys | Ile | Val | Gln | Pro | Asp | Asn | Ala | |
| | | 355 | | | | 360 | | | | | | 365 | | | | |
| ttg | gat | ttt | tta | aaa | tta | aat | tgt | tct | gag | tgt | aag | gat | att | gat | ttt | 1152 |
| Leu | Asp | Phe | Leu | Lys | Leu | Asn | Cys | Ser | Glu | Cys | Lys | Asp | Ile | Asp | Phe | |
| | 370 | | | | | 375 | | | | | 380 | | | | | |
| aaa | ccc | ttt | ttt | gaa | ttt | gaa | tat | ggg | aaa | tat | gaa | gaa | aaa | tgt | atg | 1200 |
| Lys | Pro | Phe | Phe | Glu | Phe | Glu | Tyr | Gly | Lys | Tyr | Glu | Glu | Lys | Cys | Met | |
| 385 | | | | | 390 | | | | | 395 | | | | | 400 | |
| tgt | caa | tca | tat | att | gat | tta | aaa | atc | caa | ttt | aaa | aat | aat | gat | att | 1248 |
| Cys | Gln | Ser | Tyr | Ile | Asp | Leu | Lys | Ile | Gln | Phe | Lys | Asn | Asn | Asp | Ile | |
| | | | | 405 | | | | | 410 | | | | | 415 | | |
| tgt | tca | ttt | aat | gct | caa | aca | gat | act | gtt | tct | agc | gat | aaa | aga | ttt | 1296 |
| Cys | Ser | Phe | Asn | Ala | Gln | Thr | Asp | Thr | Val | Ser | Ser | Asp | Lys | Arg | Phe | |
| | | | 420 | | | | | 425 | | | | | 430 | | | |
| tgt | ctt | gaa | aag | aaa | gaa | ttt | aaa | cca | tgg | aaa | tgt | gat | aaa | aat | tct | 1344 |
| Cys | Leu | Glu | Lys | Lys | Glu | Phe | Lys | Pro | Trp | Lys | Cys | Asp | Lys | Asn | Ser | |
| | | 435 | | | | | 440 | | | | | 445 | | | | |
| ttt | gaa | aca | gtt | cat | cat | aaa | ggg | gta | tgt | gtg | tca | ccg | aga | aga | caa | 1392 |
| Phe | Glu | Thr | Val | His | His | Lys | Gly | Val | Cys | Val | Ser | Pro | Arg | Arg | Gln | |
| | 450 | | | | | 455 | | | | | 460 | | | | | |
| ggg | ttt | tgt | tta | gga | aat | ttg | aac | tat | cta | ctg | aat | gat | gat | att | tat | 1440 |
| Gly | Phe | Cys | Leu | Gly | Asn | Leu | Asn | Tyr | Leu | Leu | Asn | Asp | Asp | Ile | Tyr | |
| 465 | | | | | 470 | | | | 475 | | | | | | 480 | |
| aat | gta | cat | aat | tca | caa | cta | ctt | atc | gaa | att | ata | atg | gct | tct | aaa | 1488 |
| Asn | Val | His | Asn | Ser | Gln | Leu | Leu | Ile | Glu | Ile | Ile | Met | Ala | Ser | Lys | |
| | | | | 485 | | | | | 490 | | | | | 495 | | |
| caa | gaa | gga | aag | tta | tta | tgg | aaa | aaa | cat | gga | aca | ata | ctt | gat | aac | 1536 |
| Gln | Glu | Gly | Lys | Leu | Leu | Trp | Lys | Lys | His | Gly | Thr | Ile | Leu | Asp | Asn | |
| | | | 500 | | | | | 505 | | | | | 510 | | | |
| cag | aat | gca | tgc | aaa | tat | ata | aat | gat | agt | tat | gtt | gat | tat | aaa | gat | 1584 |
| Gln | Asn | Ala | Cys | Lys | Tyr | Ile | Asn | Asp | Ser | Tyr | Val | Asp | Tyr | Lys | Asp | |
| | | 515 | | | | | 520 | | | | | 525 | | | | |
| ata | gtt | att | gga | aat | gat | tta | tgg | aat | gat | aac | aac | tct | ata | aaa | gtt | 1632 |
| Ile | Val | Ile | Gly | Asn | Asp | Leu | Trp | Asn | Asp | Asn | Asn | Ser | Ile | Lys | Val | |
| | 530 | | | | | 535 | | | | | 540 | | | | | |

02356.0086 SEQUENCE LISTING

| | | | | | | | | | | | | | | | | |
|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|------|
| caa Gln 545 | aat Asn | aat Asn | tta Leu | aat Asn | tta Leu 550 | att Ile | ttt Phe | gaa Glu | aga Arg | aat Asn 555 | ttt Phe | ggt Gly | tat Tyr | aaa Lys | gtt Val 560 | 1680 |
| gga Gly | aga Arg | aat Asn | aaa Lys | ctc Leu 565 | ttt Phe | aaa Lys | aca Thr | att Ile | aaa Lys 570 | gaa Glu | tta Leu | aaa Lys | aat Asn | gta Val 575 | tgg Trp | 1728 |
| tgg Trp | ata Ile | tta Leu | aat Asn 580 | aga Arg | aat Asn | aaa Lys | gta Val | tgg Trp 585 | gaa Glu | tca Ser | atg Met | aga Arg | tgt Cys 590 | gga Gly | att Ile | 1776 |
| gac Asp | gaa Glu | gta Val 595 | gat Asp | caa Gln | cgt Arg | aga Arg | aaa Lys 600 | act Thr | tgt Cys | gaa Glu | aga Arg | ata Ile 605 | gat Asp | gaa Glu | cta Leu | 1824 |
| gaa Glu | aac Asn 610 | atg Met | cca Pro | caa Gln | ttc Phe | ttt Phe 615 | aga Arg | tgg Trp | ttt Phe | tca Ser | caa Gln 620 | tgg Trp | gca Ala | cat His | ttc Phe | 1872 |
| ttt Phe 625 | tgt Cys | aag Lys | gaa Glu | aaa Lys | gaa Glu 630 | tat Tyr | tgg Trp | gaa Glu | tta Leu | aaa Lys 635 | tta Leu | aat Asn | gat Asp | aaa Lys | tgt Cys 640 | 1920 |
| aca Thr | ggt Gly | aat Asn | aat Asn | gga Gly 645 | aaa Lys | tcc Ser | tta Leu | tgt Cys | cag Gln 650 | gat Asp | aaa Lys | aca Thr | tgt Cys | caa Gln 655 | aat Asn | 1968 |
| gtg Val | tgt Cys | act Thr | aat Asn 660 | atg Met | aat Asn | tat Tyr | tgg Trp | aca Thr 665 | tat Tyr | act Thr | aga Arg | aaa Lys | tta Leu 670 | gct Ala | tat Tyr | 2016 |
| gaa Glu | ata Ile | caa Gln 675 | tcc Ser | gta Val | aaa Lys | tat Tyr | gat Asp 680 | aaa Lys | gat Asp | aga Arg | aaa Lys | tta Leu 685 | ttt Phe | agt Ser | ctt Leu | 2064 |
| gct Ala | aaa Lys 690 | gac Asp | aaa Lys | aat Asn | gta Val | act Thr 695 | aca Thr | ttt Phe | tta Leu | aag Lys | gaa Glu 700 | aat Asn | gca Ala | aaa Lys | aat Asn | 2112 |
| tgt Cys 705 | tct Ser | aat Asn | ata Ile | gat Asp | ttt Phe 710 | aca Thr | aaa Lys | ata Ile | ttc Phe | gat Asp 715 | cag Gln | ctt Leu | gac Asp | aaa Lys | ctc Leu 720 | 2160 |
| ttt Phe | aag Lys | gaa Glu | aga Arg | tgt Cys 725 | tca Ser | tgt Cys | atg Met | gat Asp | aca Thr 730 | caa Gln | gtt Val | tta Leu | gaa Glu | gta Val 735 | aaa Lys | 2208 |
| aac Asn | aaa Lys | gaa Glu | atg Met 740 | tta Leu | tct Ser | ata Ile | gac Asp | tca Ser 745 | aat Asn | agt Ser | gaa Glu | gat Asp | gca Ala 750 | aca Thr | gat Asp | 2256 |
| ata Ile | agt Ser | gag Glu 755 | aaa Lys | aat Asn | gga Gly | gag Glu | gaa Glu 760 | gaa Glu | tta Leu | tat Tyr | gta Val | aat Asn 765 | cac His | aat Asn | tct Ser | 2304 |
| gtg Val | agt Ser 770 | gtc Val | gca Ala | agt Ser | ggt Gly | aat Asn 775 | aaa Lys | gaa Glu | atc Ile | gaa Glu | aag Lys 780 | agt Ser | aag Lys | gat Asp | gaa Glu | 2352 |
| aag Lys 785 | caa Gln | cct Pro | gaa Glu | aaa Lys | gaa Glu 790 | gca Ala | aaa Lys | caa Gln | act Thr | aat Asn 795 | gga Gly | act Thr | tta Leu | acc Thr | gta Val 800 | 2400 |

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| | |
|---|------|
| cga act gac aaa gat tca gat aga aac aaa gga aaa gat aca gct act | 2448 |
| Arg Thr Asp Lys Asp Ser Asp Arg Asn Lys Gly Lys Asp Thr Ala Thr | |
| 805 810 815 | |
| gat aca aaa aat tca cct gaa aat tta aaa gta cag gaa cat gga aca | 2496 |
| Asp Thr Lys Asn Ser Pro Glu Asn Leu Lys Val Gln Glu His Gly Thr | |
| 820 825 830 | |
| aat gga gaa aca ata aaa gaa gaa cca cca aaa tta cct gaa tca tct | 2544 |
| Asn Gly Glu Thr Ile Lys Glu Glu Pro Pro Lys Leu Pro Glu Ser Ser | |
| 835 840 845 | |
| gaa aca tta caa tca caa gaa caa tta gaa gca gaa gca caa aaa caa | 2592 |
| Glu Thr Leu Gln Ser Gln Glu Gln Leu Glu Ala Glu Ala Gln Lys Gln | |
| 850 855 860 | |
| aaa caa gaa gaa gaa cca aaa aaa aaa caa gaa gaa gaa cca aaa aaa | 2640 |
| Lys Gln Glu Glu Glu Pro Lys Lys Lys Gln Glu Glu Glu Pro Lys Lys | |
| 865 870 875 880 | |
| aaa caa gaa gaa gaa caa aaa cga gaa caa gaa caa aaa caa gaa caa | 2688 |
| Lys Gln Glu Glu Glu Gln Lys Arg Glu Gln Glu Gln Lys Gln Glu Gln | |
| 885 890 895 | |
| gaa gaa gaa gaa caa aaa caa gaa gaa gaa caa caa ata caa gat caa | 2736 |
| Glu Glu Glu Glu Gln Lys Gln Glu Glu Glu Gln Gln Ile Gln Asp Gln | |
| 900 905 910 | |
| tca caa agt gga tta gat caa tcc tca aaa gta gga gta gcg agt gaa | 2784 |
| Ser Gln Ser Gly Leu Asp Gln Ser Ser Lys Val Gly Val Ala Ser Glu | |
| 915 920 925 | |
| caa aat gaa att tct tca gga caa gaa caa aac gta aaa agc tct tca | 2832 |
| Gln Asn Glu Ile Ser Ser Gly Gln Glu Gln Asn Val Lys Ser Ser Ser | |
| 930 935 940 | |
| cct gaa gta gtt cca caa gaa aca act agt gaa aat ggg tca tca caa | 2880 |
| Pro Glu Val Val Pro Gln Glu Thr Thr Ser Glu Asn Gly Ser Ser Gln | |
| 945 950 955 960 | |
| gac aca aaa ata tca agt act gaa cca aat gag aat tct gtt gta gat | 2928 |
| Asp Thr Lys Ile Ser Ser Thr Glu Pro Asn Glu Asn Ser Val Val Asp | |
| 965 970 975 | |
| aga gca aca gat agt atg aat tta gat cct gaa aag gtt cat aat gaa | 2976 |
| Arg Ala Thr Asp Ser Met Asn Leu Asp Pro Glu Lys Val His Asn Glu | |
| 980 985 990 | |
| aat atg agt gat cca aat aca aat act gaa cca gat gca tct tta aaa | 3024 |
| Asn Met Ser Asp Pro Asn Thr Asn Thr Glu Pro Asp Ala Ser Leu Lys | |
| 995 1000 1005 | |
| gat gat aag aag gaa gtt gat gat gcc aaa aaa gaa ctt caa tct | 3069 |
| Asp Asp Lys Lys Glu Val Asp Asp Ala Lys Lys Glu Leu Gln Ser | |
| 1010 1015 1020 | |
| act gta tca aga att gaa tct aat gaa cag gac gtt caa agt aca | 3114 |
| Thr Val Ser Arg Ile Glu Ser Asn Glu Gln Asp Val Gln Ser Thr | |
| 1025 1030 1035 | |
| cca ccc gaa gat act cct act gtt gaa gga aaa gta gga gat aaa | 3159 |
| Pro Pro Glu Asp Thr Pro Thr Val Glu Gly Lys Val Gly Asp Lys | |

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| 1040 | 1045 | 1050 | |
|---|--|------------------------------------|------|
| gca gaa atg tta act tct Ala Glu Met Leu Thr Ser | ccg cat gcg aca gat Pro His Ala Thr Asp | aat tct gag tcg Asn Ser Glu Ser | 3204 |
| 1055 | 1060 | 1065 | |
| gaa tca ggt tta aat cca Glu Ser Gly Leu Asn Pro | act gat gac att aaa Thr Asp Asp Ile Lys | aca act gat ggt Thr Thr Asp Gly | 3249 |
| 1070 | 1075 | 1080 | |
| gtt gtt aaa gaa caa gaa Val Val Lys Glu Gln Glu | ata tta ggg gga ggt Ile Leu Gly Gly Gly | gaa agt gca act Glu Ser Ala Thr | 3294 |
| 1085 | 1090 | 1095 | |
| gaa aca tca aaa agt aat Glu Thr Ser Lys Ser Asn | tta gaa aaa cct aag Leu Glu Lys Pro Lys | gat gtt gaa cct Asp Val Glu Pro | 3339 |
| 1100 | 1105 | 1110 | |
| tct cat gaa ata tct gaa Ser His Glu Ile Ser Glu | cct gtt ctt tct ggt Pro Val Leu Ser Gly | aca act ggt aaa Thr Thr Gly Lys | 3384 |
| 1115 | 1120 | 1125 | |
| gaa gaa tca gag tta tta Glu Glu Ser Glu Leu Leu | aaa agt aaa tcg ata Lys Ser Lys Ser Ile | gag acg aag ggg Glu Thr Lys Gly | 3429 |
| 1130 | 1135 | 1140 | |
| gaa aca gat cct cga agt Glu Thr Asp Pro Arg Ser | aat gac caa gaa gat Asn Asp Gln Glu Asp | gct act gac gat Ala Thr Asp Asp | 3474 |
| 1145 | 1150 | 1155 | |
| gtt gta gaa aat agt aga Val Val Glu Asn Ser Arg | gat gat aat aat agt Asp Asp Asn Asn Ser | ctc tct aat agc Leu Ser Asn Ser | 3519 |
| 1160 | 1165 | 1170 | |
| gta gat aat caa agt aat Val Asp Asn Gln Ser Asn | gtt tta aat aga gaa Val Leu Asn Arg Glu | gat cct att gct Asp Pro Ile Ala | 3564 |
| 1175 | 1180 | 1185 | |
| tct gaa act gaa gtt gta Ser Glu Thr Glu Val Val | agt gaa cct gag gat Ser Glu Pro Glu Asp | tca agt agg ata Ser Ser Arg Ile | 3609 |
| 1190 | 1195 | 1200 | |
| atg act aca gaa gtt cca Met Thr Thr Glu Val Pro | agt act act gta aaa Ser Thr Thr Val Lys | ccc cct gat gaa Pro Pro Asp Glu | 3654 |
| 1205 | 1210 | 1215 | |
| aaa cga tct gaa gaa gta Lys Arg Ser Glu Glu Val | gga gaa aaa gaa gct Gly Glu Lys Glu Ala | aaa gaa att aaa Lys Glu Ile Lys | 3699 |
| 1220 | 1225 | 1230 | |
| gta gaa cct gtt gta cca Val Glu Pro Val Val Pro | aga gcc att gga gaa Arg Ala Ile Gly Glu | cca atg gaa aat Pro Met Glu Asn | 3744 |
| 1235 | 1240 | 1245 | |
| tct gtg agc gta cag tcc Ser Val Ser Val Gln Ser | cct cct aat gta gaa Pro Pro Asn Val Glu | gat gtt gaa aaa Asp Val Glu Lys | 3789 |
| 1250 | 1255 | 1260 | |
| gaa aca ttg ata tct gag Glu Thr Leu Ile Ser Glu | aat aat gga tta cat Asn Asn Gly Leu His | aat gat aca cac Asn Asp Thr His | 3834 |
| 1265 | 1270 | 1275 | |
| aga gga aat atc agt gaa aag gat tta atc gat att cat ttg tta | | | 3879 |

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| | | | | | |
|---|-----------------|------|-----------------------------|-----------------|------|
| Arg Gly | Asn Ile Ser Glu | Lys | Asp Leu Ile Asp Ile | His Leu Leu | |
| 1280 | | 1285 | | 1290 | |
| aga aat | gaa gcg ggt agt | aca | ata tta gat gat | tct aga aga aat | 3924 |
| Arg Asn | Glu Ala Gly Ser | Thr | Ile Leu Asp Asp | Ser Arg Arg Asn | |
| 1295 | | 1300 | | 1305 | |
| gga gaa | atg aca gaa ggt | agc | gaa agt gat gtt | gga gaa tta caa | 3969 |
| Gly Glu | Met Thr Glu Gly | Ser | Glu Ser Asp Val | Gly Glu Leu Gln | |
| 1310 | | 1315 | | 1320 | |
| gaa cat | aat ttt agc aca | caa | caa aaa gat gaa | aaa gat ttt gac | 4014 |
| Glu His | Asn Phe Ser Thr | Gln | Gln Lys Asp Glu | Lys Asp Phe Asp | |
| 1325 | | 1330 | | 1335 | |
| caa att | gcg agc gat aga | gaa | aaa gaa gaa att | caa aaa tta ctt | 4059 |
| Gln Ile | Ala Ser Asp Arg | Glu | Lys Glu Glu Ile | Gln Lys Leu Leu | |
| 1340 | | 1345 | | 1350 | |
| aat ata | gga cat gaa gag | gat | gaa gat gta tta | aaa atg gat aga | 4104 |
| Asn Ile | Gly His Glu Glu | Asp | Glu Asp Val Leu | Lys Met Asp Arg | |
| 1355 | | 1360 | | 1365 | |
| aca gag | gat agt atg agt | gat | gga gtt aat agt | cat ttg tat tat | 4149 |
| Thr Glu | Asp Ser Met Ser | Asp | Gly Val Asn Ser | His Leu Tyr Tyr | |
| 1370 | | 1375 | | 1380 | |
| aat aat | cta tca agt gaa | gaa | aaa atg gaa caa | tat aat aat aga | 4194 |
| Asn Asn | Leu Ser Ser Glu | Glu | Lys Met Glu Gln | Tyr Asn Asn Arg | |
| 1385 | | 1390 | | 1395 | |
| gat gct | tct aaa gat aga | gaa | gaa ata ttg aat | agg tca aac aca | 4239 |
| Asp Ala | Ser Lys Asp Arg | Glu | Glu Ile Leu Asn | Arg Ser Asn Thr | |
| 1400 | | 1405 | | 1410 | |
| aat aca | tgt tct aat gaa | cat | tca tta aaa tat | tgt caa tat atg | 4284 |
| Asn Thr | Cys Ser Asn Glu | His | Ser Leu Lys Tyr | Cys Gln Tyr Met | |
| 1415 | | 1420 | | 1425 | |
| gaa aga | aat aag gat tta | tta | gaa aca tgt tct | gaa gac aaa agg | 4329 |
| Glu Arg | Asn Lys Asp Leu | Leu | Glu Thr Cys Ser | Glu Asp Lys Arg | |
| 1430 | | 1435 | | 1440 | |
| tta cat | tta tgt tgt gaa | ata | tca gat tat tgt | tta aaa ttt ttc | 4374 |
| Leu His | Leu Cys Cys Glu | Ile | Ser Asp Tyr Cys | Leu Lys Phe Phe | |
| 1445 | | 1450 | | 1455 | |
| aat cct | aaa tcg ata gaa | tac | ttt gat tgt aca | caa aaa gaa ttt | 4419 |
| Asn Pro | Lys Ser Ile Glu | Tyr | Phe Asp Cys Thr | Gln Lys Glu Phe | |
| 1460 | | 1465 | | 1470 | |
| gat gac | cct aca tat aat | tgt | ttt aga aaa caa | aga ttt aca agt | 4464 |
| Asp Asp | Pro Thr Tyr Asn | Cys | Phe Arg Lys Gln | Arg Phe Thr Ser | |
| 1475 | | 1480 | | 1485 | |
| atgtcatgtt ataaaattaa aaacaatata cattaatatg ttaataaaaa aaataatata | 4524 | | | | |
| ttttttttctc tttttctttt tttttaatag gt atg cat tat att gcc ggg ggt | 4577 | | | | |
| | | | Met His Tyr Ile Ala Gly Gly | | |
| | | | 1490 | 1495 | |
| ggt ata ata gcc ctt tta ttg ttt att tta ggt tca gcc agc tat | 4622 | | | | |
| Gly Ile Ile Ala Leu Leu Leu Phe Ile Leu Gly Ser Ala Ser Tyr | | | | | |

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1500                                1505                                1510
agg aag aat ttg taagaaaaaa aggatgaaga aatataaaca aaaatataaa      4674
Arg Lys Asn Leu

tatatgcata tatatttaag tattataaga acatatatat aaataaatat gtatattttt      4734

attttatttat tatagg gat  gat gaa aaa gga ttc  tac gat tct aat tta      4783
                Asp  Asp Glu Lys Gly Phe  Tyr Asp Ser Asn Leu
                1515                1520                1525

aat gat tct gct ttt  gaa tat aat aat aat  aaa tat aat aaa tta      4828
Asn Asp Ser Ala Phe  Glu Tyr Asn Asn Asn  Lys Tyr Asn Lys Leu
                1530                1535                1540

cct tat atg tgtaaggaaa aaactaaaaa acaaaaaaaaa aaaaaaatat      4877
Pro Tyr Met

atatatatat atatatatat acggatgcat ttccacattc ctattatttc ttattcttat      4937

aatttttatt atttatttat ttattttttt ttttc gta gtt  gat caa caa ata      4990
                        Val Val  Asp Gln Gln Ile
                        1545

aat  gta gta aat tct gat  tta tat tcg gag ggt  att tat gat gac      5035
Asn  Val Val Asn Ser Asp  Leu Tyr Ser Glu Gly  Ile Tyr Asp Asp
1550                1555                1560

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Thr  Thr Thr Phe
1565

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<211>  1568
<212>  PRT
<213>  Plasmodium falciparum

<400>  12
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Tyr Val Val Leu Cys Thr Tyr Val Leu Gly Ile Ser Glu Glu Tyr Leu
20      25      30

Lys Glu Arg Pro Gln Gly Leu Asn Val Glu Thr Asn Asn Asn Asn
35      40      45

Asn Asn Asn Asn Asn Asn Ser Asn Ser Asn Asp Ala Met Ser Phe Val
50      55      60

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Asn Glu Val Ile Arg Phe Ile Glu Asn Glu Lys Asp Asp Lys Glu Asp
 65 70 75 80
 Lys Lys Val Lys Ile Ile Ser Arg Pro Val Glu Asn Thr Leu His Arg
 85 90 95
 Tyr Pro Val Ser Ser Phe Leu Asn Ile Lys Lys Tyr Gly Arg Lys Gly
 100 105 110
 Glu Tyr Leu Asn Arg Asn Ser Phe Val Gln Arg Ser Tyr Ile Arg Gly
 115 120 125
 Cys Lys Gly Lys Arg Ser Thr His Thr Trp Ile Cys Glu Asn Lys Gly
 130 135 140
 Asn Asn Asn Ile Cys Ile Pro Asp Arg Arg Val Gln Leu Cys Ile Thr
 145 150 155 160
 Ala Leu Gln Asp Leu Lys Asn Ser Gly Ser Glu Thr Thr Asp Arg Lys
 165 170 175
 Leu Leu Arg Asp Lys Val Phe Asp Ser Ala Met Tyr Glu Thr Asp Leu
 180 185 190
 Leu Trp Asn Lys Tyr Gly Phe Arg Gly Phe Asp Asp Phe Cys Asp Asp
 195 200 205
 Val Lys Asn Ser Tyr Leu Asp Tyr Lys Asp Val Ile Phe Gly Thr Asp
 210 215 220
 Leu Asp Lys Asn Asn Ile Ser Lys Leu Val Glu Glu Ser Leu Lys Arg
 225 230 235 240
 Phe Phe Lys Lys Asp Ser Ser Val Leu Asn Pro Thr Ala Trp Trp Arg
 245 250 255
 Arg Tyr Gly Thr Arg Leu Trp Lys Thr Met Ile Gln Pro Tyr Ala His
 260 265 270
 Leu Gly Cys Arg Lys Pro Asp Glu Asn Glu Pro Gln Ile Asn Arg Trp
 275 280 285
 Ile Leu Glu Trp Gly Lys Tyr Asn Cys Arg Leu Met Lys Glu Lys Glu
 290 295 300
 Lys Leu Leu Thr Gly Glu Cys Ser Val Asn Arg Lys Lys Ser Asp Cys
 305 310 315 320

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Ser Thr Gly Cys Asn Asn Glu Cys Tyr Thr Tyr Arg Ser Leu Ile Asn
325 330 335

Arg Gln Arg Tyr Glu Val Ser Ile Leu Gly Lys Lys Tyr Ile Lys Val
340 345 350

Val Arg Tyr Thr Ile Phe Arg Arg Lys Ile Val Gln Pro Asp Asn Ala
355 360 365

Leu Asp Phe Leu Lys Leu Asn Cys Ser Glu Cys Lys Asp Ile Asp Phe
370 375 380

Lys Pro Phe Phe Glu Phe Glu Tyr Gly Lys Tyr Glu Glu Lys Cys Met
385 390 395 400

Cys Gln Ser Tyr Ile Asp Leu Lys Ile Gln Phe Lys Asn Asn Asp Ile
405 410 415

Cys Ser Phe Asn Ala Gln Thr Asp Thr Val Ser Ser Asp Lys Arg Phe
420 425 430

Cys Leu Glu Lys Lys Glu Phe Lys Pro Trp Lys Cys Asp Lys Asn Ser
435 440 445

Phe Glu Thr Val His His Lys Gly Val Cys Val Ser Pro Arg Arg Gln
450 455 460

Gly Phe Cys Leu Gly Asn Leu Asn Tyr Leu Leu Asn Asp Asp Ile Tyr
465 470 475 480

Asn Val His Asn Ser Gln Leu Leu Ile Glu Ile Ile Met Ala Ser Lys
485 490 495

Gln Glu Gly Lys Leu Leu Trp Lys Lys His Gly Thr Ile Leu Asp Asn
500 505 510

Gln Asn Ala Cys Lys Tyr Ile Asn Asp Ser Tyr Val Asp Tyr Lys Asp
515 520 525

Ile Val Ile Gly Asn Asp Leu Trp Asn Asp Asn Asn Ser Ile Lys Val
530 535 540

Gln Asn Asn Leu Asn Leu Ile Phe Glu Arg Asn Phe Gly Tyr Lys Val
545 550 555 560

Gly Arg Asn Lys Leu Phe Lys Thr Ile Lys Glu Leu Lys Asn Val Trp
565 570 575

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Trp Ile Leu Asn Arg Asn Lys Val Trp Glu Ser Met Arg Cys Gly Ile
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 Asp Glu Val Asp Gln Arg Arg Lys Thr Cys Glu Arg Ile Asp Glu Leu
 595 600 605
 Glu Asn Met Pro Gln Phe Phe Arg Trp Phe Ser Gln Trp Ala His Phe
 610 615 620
 Phe Cys Lys Glu Lys Glu Tyr Trp Glu Leu Lys Leu Asn Asp Lys Cys
 625 630 635 640
 Thr Gly Asn Asn Gly Lys Ser Leu Cys Gln Asp Lys Thr Cys Gln Asn
 645 650 655
 Val Cys Thr Asn Met Asn Tyr Trp Thr Tyr Thr Arg Lys Leu Ala Tyr
 660 665 670
 Glu Ile Gln Ser Val Lys Tyr Asp Lys Asp Arg Lys Leu Phe Ser Leu
 675 680 685
 Ala Lys Asp Lys Asn Val Thr Thr Phe Leu Lys Glu Asn Ala Lys Asn
 690 695 700
 Cys Ser Asn Ile Asp Phe Thr Lys Ile Phe Asp Gln Leu Asp Lys Leu
 705 710 715 720
 Phe Lys Glu Arg Cys Ser Cys Met Asp Thr Gln Val Leu Glu Val Lys
 725 730 735
 Asn Lys Glu Met Leu Ser Ile Asp Ser Asn Ser Glu Asp Ala Thr Asp
 740 745 750
 Ile Ser Glu Lys Asn Gly Glu Glu Glu Leu Tyr Val Asn His Asn Ser
 755 760 765
 Val Ser Val Ala Ser Gly Asn Lys Glu Ile Glu Lys Ser Lys Asp Glu
 770 775 780
 Lys Gln Pro Glu Lys Glu Ala Lys Gln Thr Asn Gly Thr Leu Thr Val
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 Arg Thr Asp Lys Asp Ser Asp Arg Asn Lys Gly Lys Asp Thr Ala Thr
 805 810 815
 Asp Thr Lys Asn Ser Pro Glu Asn Leu Lys Val Gln Glu His Gly Thr
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825 830

820

Asn Gly Glu Thr Ile Lys Glu Glu Pro Pro Lys Leu Pro Glu Ser Ser
835 840 845

Glu Thr Leu Gln Ser Gln Glu Gln Leu Glu Ala Glu Ala Gln Lys Gln
850 855 860

Lys Gln Glu Glu Glu Pro Lys Lys Lys Gln Glu Glu Glu Pro Lys Lys
865 870 875 880

Lys Gln Glu Glu Glu Gln Lys Arg Glu Gln Glu Gln Lys Gln Glu Gln
885 890 895

Glu Glu Glu Glu Gln Lys Gln Glu Glu Glu Gln Gln Ile Gln Asp Gln
900 905 910

Ser Gln Ser Gly Leu Asp Gln Ser Ser Lys Val Gly Val Ala Ser Glu
915 920 925

Gln Asn Glu Ile Ser Ser Gly Gln Glu Gln Asn Val Lys Ser Ser Ser
930 935 940

Pro Glu Val Val Pro Gln Glu Thr Thr Ser Glu Asn Gly Ser Ser Gln
945 950 955 960

Asp Thr Lys Ile Ser Ser Thr Glu Pro Asn Glu Asn Ser Val Val Asp
965 970 975

Arg Ala Thr Asp Ser Met Asn Leu Asp Pro Glu Lys Val His Asn Glu
980 985 990

Asn Met Ser Asp Pro Asn Thr Asn Thr Glu Pro Asp Ala Ser Leu Lys
995 1000 1005

Asp Asp Lys Lys Glu Val Asp Asp Ala Lys Lys Glu Leu Gln Ser
1010 1015 1020

Thr Val Ser Arg Ile Glu Ser Asn Glu Gln Asp Val Gln Ser Thr
1025 1030 1035

Pro Pro Glu Asp Thr Pro Thr Val Glu Gly Lys Val Gly Asp Lys
1040 1045 1050

Ala Glu Met Leu Thr Ser Pro His Ala Thr Asp Asn Ser Glu Ser
1055 1060 1065

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| | | | | | | | | | | | | | | |
|------|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|------|-----|-----|-----|
| Glu | Ser | Gly | Leu | Asn | Pro | Thr | Asp | Asp | Ile | Lys | Thr | Thr | Asp | Gly |
| 1070 | | | | | | 1075 | | | | | 1080 | | | |
| Val | Val | Lys | Glu | Gln | Glu | Ile | Leu | Gly | Gly | Gly | Glu | Ser | Ala | Thr |
| 1085 | | | | | | 1090 | | | | | 1095 | | | |
| Glu | Thr | Ser | Lys | Ser | Asn | Leu | Glu | Lys | Pro | Lys | Asp | Val | Glu | Pro |
| 1100 | | | | | | 1105 | | | | | 1110 | | | |
| Ser | His | Glu | Ile | Ser | Glu | Pro | Val | Leu | Ser | Gly | Thr | Thr | Gly | Lys |
| 1115 | | | | | | 1120 | | | | | 1125 | | | |
| Glu | Glu | Ser | Glu | Leu | Leu | Lys | Ser | Lys | Ser | Ile | Glu | Thr | Lys | Gly |
| 1130 | | | | | | 1135 | | | | | 1140 | | | |
| Glu | Thr | Asp | Pro | Arg | Ser | Asn | Asp | Gln | Glu | Asp | Ala | Thr | Asp | Asp |
| 1145 | | | | | | 1150 | | | | | 1155 | | | |
| Val | Val | Glu | Asn | Ser | Arg | Asp | Asp | Asn | Asn | Ser | Leu | Ser | Asn | Ser |
| 1160 | | | | | | 1165 | | | | | 1170 | | | |
| Val | Asp | Asn | Gln | Ser | Asn | Val | Leu | Asn | Arg | Glu | Asp | Pro | Ile | Ala |
| 1175 | | | | | | 1180 | | | | | 1185 | | | |
| Ser | Glu | Thr | Glu | Val | Val | Ser | Glu | Pro | Glu | Asp | Ser | Ser | Arg | Ile |
| 1190 | | | | | | 1195 | | | | | 1200 | | | |
| Met | Thr | Thr | Glu | Val | Pro | Ser | Thr | Thr | Val | Lys | Pro | Pro | Asp | Glu |
| 1205 | | | | | | 1210 | | | | | 1215 | | | |
| Lys | Arg | Ser | Glu | Glu | Val | Gly | Glu | Lys | Glu | Ala | Lys | Glu | Ile | Lys |
| 1220 | | | | | | 1225 | | | | | 1230 | | | |
| Val | Glu | Pro | Val | Val | Pro | Arg | Ala | Ile | Gly | Glu | Pro | Met | Glu | Asn |
| 1235 | | | | | | 1240 | | | | | 1245 | | | |
| Ser | Val | Ser | Val | Gln | Ser | Pro | Pro | Asn | Val | Glu | Asp | Val | Glu | Lys |
| 1250 | | | | | | 1255 | | | | | 1260 | | | |
| Glu | Thr | Leu | Ile | Ser | Glu | Asn | Asn | Gly | Leu | His | Asn | Asp | Thr | His |
| 1265 | | | | | | 1270 | | | | | 1275 | | | |
| Arg | Gly | Asn | Ile | Ser | Glu | Lys | Asp | Leu | Ile | Asp | Ile | His | Leu | Leu |
| 1280 | | | | | | 1285 | | | | | 1290 | | | |
| Arg | Asn | Glu | Ala | Gly | Ser | Thr | Ile | Leu | Asp | Asp | Ser | Arg | Arg | Asn |
| 1295 | | | | | | 1300 | | | | | 1305 | | | |

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Gly Glu Met Thr Glu Gly Ser Glu Ser Asp Val Gly Glu Leu Gln
 1310 1315 1320
 Glu His Asn Phe Ser Thr Gln Gln Lys Asp Glu Lys Asp Phe Asp
 1325 1330 1335
 Gln Ile Ala Ser Asp Arg Glu Lys Glu Glu Ile Gln Lys Leu Leu
 1340 1345 1350
 Asn Ile Gly His Glu Glu Asp Glu Asp Val Leu Lys Met Asp Arg
 1355 1360 1365
 Thr Glu Asp Ser Met Ser Asp Gly Val Asn Ser His Leu Tyr Tyr
 1370 1375 1380
 Asn Asn Leu Ser Ser Glu Glu Lys Met Glu Gln Tyr Asn Asn Arg
 1385 1390 1395
 Asp Ala Ser Lys Asp Arg Glu Glu Ile Leu Asn Arg Ser Asn Thr
 1400 1405 1410
 Asn Thr Cys Ser Asn Glu His Ser Leu Lys Tyr Cys Gln Tyr Met
 1415 1420 1425
 Glu Arg Asn Lys Asp Leu Leu Glu Thr Cys Ser Glu Asp Lys Arg
 1430 1435 1440
 Leu His Leu Cys Cys Glu Ile Ser Asp Tyr Cys Leu Lys Phe Phe
 1445 1450 1455
 Asn Pro Lys Ser Ile Glu Tyr Phe Asp Cys Thr Gln Lys Glu Phe
 1460 1465 1470
 Asp Asp Pro Thr Tyr Asn Cys Phe Arg Lys Gln Arg Phe Thr Ser
 1475 1480 1485
 Met His Tyr Ile Ala Gly Gly Gly Ile Ile Ala Leu Leu Leu Phe
 1490 1495 1500
 Ile Leu Gly Ser Ala Ser Tyr Arg Lys Asn Leu Asp Asp Glu Lys
 1505 1510 1515
 Gly Phe Tyr Asp Ser Asn Leu Asn Asp Ser Ala Phe Glu Tyr Asn
 1520 1525 1530
 Asn Asn Lys Tyr Asn Lys Leu Pro Tyr Met Val Val Asp Gln Gln
 1535 1540 1545

02356.0086 SEQUENCE LISTING

Ile Asn Val Val Asn Ser Asp Leu Tyr Ser Glu Gly Ile Tyr Asp
 1550 1555 1560

Asp Thr Thr Thr Phe
 1565

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<213> artificial sequence

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<223> sequence is completely synthesized

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02356.0086 SEQUENCE LISTING

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21